

ROYAL ASTRONOMICAL SOCIETY.

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No. 6.

G. B. AIRY, Esq., Astronomer Royal, President, in the Chair.*

Thomas Dell, Esq., Aylesbury;

Wm. Garrow Lettsom, Esq., British Legation, Washington;

Wm. Rutter, Esq., Haverstock Hill;

Edward Ryley, Esq., Leadenhall Street; and the

Rev. Charles Pritchard, Clapham;

were balloted for and duly elected Fellows of the Society.

The New Tables of the Sun, begun by Bessel and continued by Professor Hansen, are now completed. Professor Schumacher hopes they may be published this year.

NEW COMET.†

On the 14th of April, at 10^h 30^m P.M., Mr. Graham, of the Markree Observatory, discovered a comet in the constellation *Bootis*, not far from ϵ .

The following observations are corrected for aberration and parallax:

Greenwich M.T.		α		δ	
1849.		°	' "	°	' "
April	14.48780	222	21 14	+ 27	40 16
	16.51120	217	53 6	26	38 4
	19.51041	209	22 58	+ 24	5 26

From which Mr. Graham has deduced these elements,—

Perihelion Passage, 1849, June 8.238, Greenwich M.T.

$$\begin{array}{l} \pi = 266^{\circ} 59' 12'' \\ \Omega \quad 30 \quad 29 \quad 38 \\ i \quad 67 \quad 11 \quad 45 \end{array} \left. \vphantom{\begin{array}{l} \pi \\ \Omega \\ i \end{array}} \right\} \text{App. Eq. April 17.}$$

Log. $q = 9.95214$ Motion Direct.

* A memoir was read, "On the Computation of the Orbits of Double Stars," by Sir John Herschel, with some remarks by the President, which will appear in the next *Notice*.

† In a letter received from Professor Schumacher, we are told that this comet was previously discovered by Professor Schweizer at Moskow.

CAMBRIDGE, U.S.

(Professor Bond.)

1849.	Cambridge M.T.			R.A.			Dec.		
	h	m	s	h	m	s	°	'	"
April 11	10	56	29	15	9	6.11	+28	33	27.0
12	7	57	58	15	3	36.28	28	20	9.1
14	10	35	59	14	48	12.14	27	36	33.7
17	8	48	52	14	20	40.60	+25	54	23.4

Referred to the Mean Equinox, Jan. 1, 1849.

"The comet has a strong starlike central condensation, an extensive coma, and no tail."

Approximate Ephemeris. By Mr. Graham.For 8^h P.M. Greenwich M.T.

1849.	R.A.			N.P.D.	1849.	R.A.			N.P.D.		
	h	m	s	°		h	m	s	°		
April 23	12	58	15	71 57	May 4	9	26	18	103 51		
24		39	51	74 11	5	9	11	32	105 54		
25	12	20	16	76 51	6	8	58	1	107 44		
26	11	59	51	79 50	7		45	40	109 20		
27		39	6	82 59	8		34	20	110 45		
28	11	18	4	86 15	9		23	58	111 58		
29	10	57	22	89 32	10		14	31	113 3		
30		37	12	92 47	11	8	5	50	114 1		
May 1	10	17	45	95 54	12	7	57	49	114 47		
2	9	59	25	98 49	13		50	30	115 31		
3	42	14		101 28	14	7	43	55	116 11		
Hor. Par.				Hor. Par.				Hor. Par.			
April 23	36.3			April 29	41.3			May 5	33.4		
24	38.0			30	40.7			6	31.8		
25	39.3			May 1	39.7			7	30.1		
26	40.4			2	38.3			8	28.5		
27	41.1			3	36.8			9	27.1		
28	41.5			4	35.0						
Hor. Par.				Hor. Par.				Hor. Par.			
April 23	25.6			April 29	24.4			May 5	23.3		
24	24.4			30	22.4			6	21.1		
25	23.3			May 1	21.1			7	20.0		
26	22.4			2	20.0			8	18.9		
27	21.1			3	18.9			9	17.8		
28	20.0			4	17.8						

GOUJON'S NEW COMET.

This comet was discovered by M. Goujon, of the Paris Observatory, on April 15th. Mr. Hind has favoured us with the following apparent places, *uncorrected* for parallax:—

	Greenwich M.T.			R.A.			Dec.			
1849.	h	m	s	°	'	"	°	'	"	
April 15	10	45	30	167	6	59.4	—25	31	26.2	Goujon.
17	10	22	27	166	40	29.3	19	31	20.2	Hind.
20	10	49	3	166	7	47.4	9	34	44.3	Hind.
21	9	56	32	165	59	16.1	—6	14	56.3	Boreham.
23	11	59	56	165	44	10.3	+0	56	12.9	Hartnup.

IRIS.

LIVERPOOL.

Equatoreal.

(Mr. Hartnup.)

1849.	Greenwich M.T.			R.A.			N.P.D.			Comp ^d —Observ ^d .		Star.
	h	m	s	h	m	s	°	'	"	R.A.	N.P.D.	
Mar. 6	10	35	31.5	9	38	10.80	84	53	5.8	—1.60	+2.1	a
8	11	1	4.6	36	41.10		42	39.7		1.64	3.2	a
9	10	48	27.2	35	59.16		37	36.5		1.63	4.1	b
16	9	50	33.9	31	47.75		84	4	4.0	1.88	6.1	c
17	10	3	11.1	31	17.88		83	59	32.7	2.00	5.1	c
24	10	32	16.4	28	37.20		30	46.9		1.96	3.4	c
27	8	51	39.5	27	55.54		20	22.1		2.13	3.8	c
31	9	7	4.9	27	22.30			7	47.1	2.10	2.4	d
April 1	10	47	44.3	27	17.96		83	4	45.9	1.99	1.6	d
3	10	40	11.0	27	15.25		82	59	30.4	1.97	1.2	d
11	11	10	40.4	28	8.70		43	23.7		1.88	1.2	d
14	9	8	58.0	28	52.67		39	31.0		1.92	3.7	d
15	8	56	52.4	9	29	10.27	82	38	28.2	—1.76	+3.0	d
a	3295,	3412		B.A.C.			c	3203,	3359	B.A.C.		
b	3295,	3359		—			d	3228,	3386	—		

"The places of the stars of comparison are taken from the catalogue cited. The observed places are corrected for refraction and parallax. The computed places are deduced from the ephemeris of MM. Hind and Pogson, which is printed in the *Monthly Notice*, vol. ix. No. 5."

HEBE.

Ephemeris for 8^h P.M. Greenwich Mean Time.

Taken from M. Luther's *Ephemeris* in the *Astronomische Nachrichten*, by permission of Professor Schumacher.

1849.	R.A.			N.P.D.			1849.	R.A.			N.P.D.		
	h	m	s	°	'	"		h	m	s	°	'	"
April 20	6	44	46.03	70	44	33.8	May 11	7	17	39.16	70	9	32.1
21		46	15.87		41	49.2	12		19	16.80		9	1.5
22		47	46.19		39	11.1	13		20	54.69		8	37.2
23		49	17.00		36	39.5	14		22	32.83		8	18.9
24		50	48.27		34	14.5	15		24	11.23		8	6.6
25		52	20.00		31	56.0	16		25	49.87		8	0.5
26		53	52.18		29	44.0	17		27	28.73		8	0.5
27		55	24.77		27	38.5	18		29	7.83		8	6.4
28		56	57.78		25	39.5	19		30	47.15		8	18.3
29	6	58	31.19		23	46.9	20		32	26.68		8	36.2
30	7	0	4.98		22	0.8	21		34	6.40		9	0.1
May 1		1	39.16		20	21.1	22		35	46.31		9	29.8
2		3	13.70		18	47.8	23		37	26.41		10	5.4
3		4	48.58		17	20.8	24		39	6.68		10	46.8
4		6	23.81		16	0.2	25		40	47.13		11	34.0
5		7	59.38		14	46.0	26		42	27.73		12	27.0
6		9	35.26		13	38.0	27		44	8.47		13	25.7
7		11	11.45		12	36.4	28		45	49.35		14	30.0
8		12	47.95		11	41.0	29		47	30.38		15	40.1
9		14	24.74		10	51.8	30		49	11.51		16	55.7
10	7	16	1.81	70	10	8.8	31	7	50	52.76	70	18	16.9

Reckoned from the true equinox and corrected for aberration.

Horizontal Parallax.					
April 20	3 ^{''} 3	May 6	3 ^{''} 0	May 22	2 ^{''} 8
24	3 ^{''} 2	10	3 ^{''} 0	26	2 ^{''} 8
28	3 ^{''} 1	14	2 ^{''} 9	30	2 ^{''} 7
May 2	3 ^{''} 1	18	2 ^{''} 9		

Observations of Wilmot's Comet. By Mr. Maclear.

Mr. Maclear's absence from the Observatory, while engaged in the measurement of an arc of the meridian, has occasioned a considerable delay in reducing the observations of this comet.

The places of the comet are corrected for refraction, and the log. factor is annexed to each, which, when added to the log. hor. parallax in seconds of space, will give the log. correction in right ascension and north polar distance, in time and arc respectively.

The catalogue of the stars of comparison is appended.*

CAPE OF GOOD HOPE.

(Mr. Maclear.)

	Cape M.T. h m s	R.A. h m s	Log. Fact.	N.P.D. ° ' "	Log. Fact.	Obs.	Star.
1844. Dec. 24	8 17 29	19 43 11 ^h 86	+8 ^h 8384	128 12 17 ^h 1	+9 ^h 7346	2	1
27	8 14 23	20 16 49 ^h 16	8637	131 3 41 ^h 0	6756	10	2
	8 37 35	17 0 ^h 34	8571	131 4 27 ^h 7	7221	10	3
28	8 19 14	28 30 ^h 05	8707	131 50 48 ^h 8	6413	10	4
	9 7 33	28 58 ^h 68	8519	131 52 36 ^h 5	7601	8	4
30	8 38 34			133 10 14 ^h 1	6644	6	5
	8 38 57	52 54 ^h 72	8781			7	5
	9 6 2	53 8 ^h 60	8699			9	6
	9 6 30			133 11 0 ^h 9	7239	8	6
	9 31 50	20 53 22 ^h 03	8562	133 11 24 ^h 8	7706	6	5
31	8 31 24	21 5 14 ^h 12	8838	133 41 11 ^h 1	6232	10	7
	9 8 33	5 33 ^h 21	8759	133 41 54 ^h 3	7090	10	7
1845. Jan. 1	8 42 57	17 52 ^h 05	8867	134 6 43 ^h 3	6279	9	8
3	9 20 28	21 43 32 ^h 37	8876	134 40 29 ^h 4	6733	5	9
5	9 58 45	22 9 13 ^h 66	8819	134 50 48 ^h 0	7178	7	10
6	8 14 9	20 52 ^h 14	8762	134 47 45 ^h 7	3761	10	11
	9 9 6	21 20 ^h 25	8920	134 47 37 ^h 7	5745	10	12
	9 34 12	21 33 ^h 45	8909			12	11
	9 45 58			134 47 21 ^h 8	6710	12	11
	10 3 6	21 48 ^h 59	8832			12	11
9	9 1 59	57 46 ^h 20	8809	134 7 3 ^h 5	4821	12	13
	9 25 21	57 57 ^h 78	8861			10	13
	9 40 13			134 6 29 ^h 2	+9 ^h 5977	14	13
	9 58 20	22 58 13 ^h 79	+8 ^h 8859			8	13

* The columns R.A. Comet—R.A. Star; and N.P.D. Comet—N.P.D. Star, are omitted, though given by Mr. Maclear.

Observations of Wilmot's Comet.

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1845. Jan. 11	Cape M.T.	R.A.	Log. Fact.	N.P.D.	Log. Fact.	Obs.	Star.
	^h _h ^m _m ^s _s	^h _h ^m _m ^s _s		[°] _° ['] _' ["] _"			
11	9 24 12	23 20 52.27	+8.8769	133 16 47.8	+9.5120	10	14
12	9 14 46	31 46.43	.8678	132 46 3.1	.4615	10	15
	9 54 17	23 32 3.50	.8771	132 45 17.5	.5860	10	16
15	9 26 43	0 2 28.99	.8522	130 54 35.8	.4619	10	18
	9 58 4	2 40.56	.8624	130 53 49.8	.5596	10	17
16	10 34 4	12 20.42	.8601	130 10 32.7	.6378	14	19
17	10 13 24	21 15.02	.8540	129 27 9.0	.5846	6	20
18	9 41 9	29 43.50	.8376	128 42 36.9	.4873	15	21
19	9 49 12	38 4.28	.8347	127 55 25.6	.5077	1	22
	10 19 42	0 38 15.38	.8442	127 54 26.0	.5898	2	22
22	9 4 24	1 0 39.50	.7824	125 31 34.0	.3660	10	23
	9 55 28	0 54.76	.8189	125 29 51.0	.5220	10	23
24	9 3 13	14 17.40	.7668			12	24
	9 21 26			123 52 10.0	.4328	16	24
	10 12 54	14 36.41	.8154			12	24
25	8 54 28	20 38.21	.7504	123 3 39.1	.3581	10	25
	9 30 23	20 47.48	.7851	123 2 23.7	.4642	10	26
27	9 49 2	32 49.33	.7878	121 23 37.6	.5227	8	27
28	9 41 9	38 24.33	.7775	120 35 31.2	.5104	12	28
29	9 41 14	43 47.05	.7726	119 47 20.1	.5174	12	29
30	9 51 33	48 59.60	.7760			12	30
31	9 38 0	53 55.49	.7620			16	31
	10 1 9			118 12 39.4	.5713	16	31
	10 25 23	54 5.35	.7897			16	31
Feb. 1	9 39 6	58 42.56	.7591			12	32
	10 0 54			117 26 35.5	.5765	10	32
	10 23 5	1 58 51.47	.7854			12	33
3	9 28 17	2 7 42.89	.7432			16	33
	9 49 55			115 57 10.7	.5697	14	33
	10 12 25	7 51.07	.7744			16	33
4	9 10 9	11 57.32	.7216			16	34
	9 32 3			115 13 58.5	.5462	16	34
	9 53 24	12 5.26	.7603			16	34
8	9 8 5			112 28 14.6	.5426	10	35
	9 34 33	27 45.67	.7366			30	35
	9 58 15			112 26 46.9	.6163	10	35
9	9 12 28	31 20.25	.7133			16	36
	9 30 19			111 48 6.8	.5819	12	36
	9 51 45	31 26.21	.7481			16	36
10	9 25 53	34 52.63	.7254			14	37
	9 44 26			111 9 6.7	.6088	14	37
	10 6 29	34 58.50	.7556			8	37
16	8 56 57	2 53 55.80	+8.6896			12	39
	9 10 60			107 35 38.9	+9.6097	10	39

1845.	Cape M.T. h m s	R.A. h m s	Log. Fact.	N.P.D. ° ' "	Log. Fact.	Obs.	Star.
Feb. 16	9 24 24	2 53 59.66	+8.7188			12	39
18	8 54 11	59 40.78	.6864			12	40
	9 17 13			106 30 24.9	+9.6285	10	40
	9 37 34	2 59 45.76	.7305			12	40
27	8 19 16	3 22 32.18	.6476			20	41
	8 40 56			102 12 51.5	.6503	12	41
	9 2 56	22 36.89	.7014			20	41
28	8 30 7	24 52.27	.6647			12	42
	8 46 22			101 47 14.6	.6586	12	42
	9 2 8	24 54.93	.7016			12	42
Mar. 4	9 0 50			100 10 29.9	.6687	10	43
	9 20 50	33 47.16	.7209			18	43
5	8 48 1	35 52.63	.6933			18	44
	9 8 43			99 47 39.5	.6910	10	44
6	8 57 18	37 58.38	.7037			16	45
	9 13 12			99 25 17.0	.6965	10	45
9	8 20 25	44 2.21	.6687			24	46
	8 49 43			98 21 51.3	.6953	12	46
12	8 25 49	3 49 55.75	+8.6811			20	47
	8 46 5			97 22 16.9	+9.7038	14	47

*Catalogue of the Mean Right Ascensions and North Polar Distances
of the Stars compared with Wilmot's Comet.*

Star's No.	Mag- nitude.	R.A. 1845, Jan. 1. h m s	Annual Precess. s +	No. of Obs.	N.P.D. 1845, Jan. 1. ° ' "	Annual Precess. " -	No. of Obs.
1		19 42 26.93	4.014	9	128 3 11.8	8.67	3
2	8	20 16 24.71	4.030	7	130 54 46.4	11.24	5
3	9	17 15.28	4.035	4	131 8 20.3	11.30	4
4	Lacaille 8497	27 22.86	4.026	11	131 45 30.7	12.03	6
6		51 43.50	3.973	8	132 40 48.2	13.66	4
5	Lacaille 8638	20 52 0.57	4.002	7	133 35 43.9	13.68	9
7	9	21 5 55.50	3.947	9	133 35 42.7	14.54	6
8	Lacaille 8822	19 49.58	3.906	15	134 10 41.8	15.35	10
9	9	21 44 27.08	3.804	8	134 31 37.3	16.65	5
10	8	22 7 5.47	3.692	10	134 30 20.8	17.67	8
12	δ Gruis	20 28.28	3.624	15	134 32 21.6	18.19	5
11	B.A.C. 7834	21 25.28	3.626	6	134 53 9.6	18.23	6
13	θ Gruis	22 58 7.42	3.419	14	134 21 20.5	19.33	12
14	B.A.C. 8186	23 22 10.92	3.274	20	132 50 20.8	19.78	15
16	8	33 12.44	3.213	13	132 26 21.0	19.92	11

Star's No.		Mag- nitude.	R.A. 1845, Jan. 1.			Annual Precess.	No. of Obs.	N.P.D. 1845, Jan. 1.			Annual Precess.	No. of Obs.
			h	m	s			°	'	"		
15	B.A.C. 8242	7.8	23	33	41.93	3.214	6	133	7	34.5	19.92	4
17	Lacaille 9739	8	0	1	5.62	3.065	9	130	35	58.4	20.05	8
18	Lacaille 9757	8		3	26.93	3.053	6	131	14	6.9	20.05	9
19	Lacaille 50	7.8	13	10	70	3.006	9	130	5	57.2	20.02	6
20	Lacaille 126	8.9	26	2	46	2.945	7	129	32	24.9	19.93	5
21	B.A.C. 144	8	27	5	20	2.944	5	128	51	4.8	19.91	8
22	Lacaille 216	8	40	6	80	2.890	7	127	46	21.4	19.75	13
23	Lacaille 304	7.8	0	59	0.63	2.827	10	125	37	42.6	19.39	10
24		8	1	14	28.18	2.782	14	124	2	48.8	19.01	7
25		7	19	49	64	2.770	13	123	20	55.0	18.85	9
26		8.9	21	45	06	2.769	5	122	50	33.5	18.79	7
28		9	36	43	60	2.747	7	120	35	45.3	18.29	3
27		9	36	53	32	2.734	6	121	30	32.8	18.29	8
29	Lacaille 535	8	42	53	18	2.738	13	119	48	42.7	18.07	6
30		9.10	48	28	39	2.740	6	118	28	28.1	17.85	6
31		9	52	43	81	2.732	6	118	13	34.8	17.68	5
32		8.9	1	55	31.57	2.734	7	117	29	29.4	17.56	6
33		10	2	6	29.92	2.728	7	116	3	43.3	17.08	3
34		9	12	57	26	2.726	4	115	11	41.4	16.77	5
35	Lacaille 787	7.8	27	31	74	2.736	11	112	36	34.1	16.04	8
36		8.9	31	30	45	2.744	9	111	42	42.1	15.83	10
37		8.9	35	31	75	2.745	4	111	12	3.4	15.61	5
39	Lalande 5621	8	2	54	9.97	2.774	6	107	51	1.0	14.54	4
40		9	3	2	6.59	2.786	6	106	36	32.0	14.05	3
41	Lalande 6492	7.8	22	50	24	2.847	13	102	10	42.9	12.70	10
42	Weisse iii, 476	8	25	51	45	2.854	7	101	42	9.1	12.49	5
44	Weisse iii, 650	8	33	53	66	2.887	12	99	41	43.9	11.94	5
43	δ Eridani	3.4	35	49	58	2.874	9	100	17	31.5	11.80	3
45	Weisse iii, 746	7	38	28	57	2.888	12	99	29	49.3	11.61	2
46	Lalande 7246	7	47	10	74	2.906	10	98	22	1.6	10.98	6
47	Lalande 7370	7	3	50	37.19	2.904	7	97	23	33.2	10.73	4

On the Form of the Planet Saturn. By the Rev. R. Main.

Sir W. Herschel, from repeated estimations with various telescopes made with the greatest care (and assuredly with the most practised eye and unbiassed judgment ever brought to such a task), convinced himself that the figure of *Saturn* was not elliptical, but "like a parallelogram with the corners rounded off." He was also

of opinion that the northern and southern polar regions were of a very different shape. This latter opinion was also held by his son, Sir John Herschel. The disappearance of the ring, which happened towards the end of last year, induced Mr. Main to undertake a large series of micrometrical observations, which confirmed the impression he had received from mere inspection, that the form of *Saturn*, without his ring, is a perfect ellipse of considerable ellipticity.

The observations were made with the large telescope by Cauchoix, mounted equatorially, and the divided eye-piece micrometer. Up to October 25, 1848, the eye-piece was used which is described in the *Greenwich Observations*, 1840, *et seq.*, and after that time an improved eyepiece, on the same principle, was employed. This latter construction, which is greatly preferred by Mr. Main, as giving each image equally good in every part of the field and with better definition, is described by the Astronomer Royal in vol. xv. of our *Memoirs*. The results of the two micrometers seem, however, of equal value.

Mr. Main gives, in full detail, measures of the planet in and near the polar and equatorial diameters, and in and near the intermediate directions. After shewing that a slight error in the assumed angular direction of the pole cannot sensibly affect the ellipticity, Mr. Main gives the following table of the measures of the diameters reduced to arc at a mean distance, $\log. = 0.95$.

Apparent Diameters of *Saturn* : Distance = [0.95.]

		Equatorial.	Polar.	Inclined.	Transverse.
		"	"	"	"
1848. Sept.	6	19.16	16.83		
	18	18.82	16.66		
	19	18.65	16.78		18.00
	20	18.53	16.46	17.32	17.70
	22	18.75	16.44	17.58	17.58
Oct.	5	18.84	16.44	17.29	17.53
	9	18.41	16.34	17.41	17.46
	25	18.62	16.54	17.34	17.78
Nov.	15	18.18	16.58	17.41	17.76
	21	18.65	16.77	17.60	17.90
1849. Jan.	26	18.83	16.77	17.92	18.33

Mr. Main remarks, 1st, That the absolute measures vary on different evenings considerably beyond the limits of the probable errors of the observations, for which the only obvious cause seems to be a change in atmospheric circumstances. 2. That the change seems to affect the measures in all directions pretty equally, except that the measures of the polar diameter seem somewhat more consistent, which may be due to the lateral tremor produced by the clock-work, or to the air being more disturbed horizontally than vertically.

From the above measures, adopting a formula supplied by the Astronomer Royal, Mr. Main finds the ellipticity, or $\frac{a-b}{a}$ (a and b being the observed equatoreal and polar diameters) = 0.10925 with probable error 0.00081 ; or ellipticity = $\frac{1}{9.153}$.

Mr. Main then reduces his measures of the inclined diameters to what they would have been if the two sets had been measured respectively at exactly 45° to the direction of the axis of the ring given in the *Nautical Almanac*, and finds that they are then perfectly equal. As a further proof of the perfect ellipticity of *Saturn*, Mr. Main shews that the mean of the polar and equatoreal measures is equal to the mean of the inclined measures, which should be the case, as far as the second powers of the eccentricity.

The final value of the arc subtended by the equatoreal diameter of *Saturn*, when the log. distance = 0.95 , is $18''.73$, and that subtended by the polar diameter at the same distance is $16''.68$.*

Some Remarks on the Method of the Astronomer Royal for ascertaining the Difference between the true and spurious Disc of Venus. By Mr. Sheepshanks.

“Having understood from Mr. Adams, that he wanted some good measures of the diameter of *Venus*, I wrote to Mr. Hartnup, requesting him to apply his equatoreal to that planet. In three or four days I received the following answer:—

‘Wire Micrometer, Means of 10 Measures.

Feb. 27	^d 6	^h 31,	Diameter = 24''.66,	Power 400
28	5	11,	„ = 24''.69,	„ 180

‘Double Image Micrometer, Means of 5 Double Measures.

Feb. 27	^d 6	^h 56,	Diameter = 23''.38,	Power 161
28	5	40,	„ = 23''.62,	„

“‘I cannot,’ continues Mr. Hartnup, ‘at present account for the difference between the wire-micrometer and the divided eye-piece, can you suggest anything which I can do to find it out?’

“On thinking the matter over, I hit upon a plan which I shall shortly explain; but I learned from the Astronomer Royal, that he had used the same method eleven years ago for correcting the disc of *Venus*, and had fully developed it in the volume of *Greenwich Observations for 1838*, page lii.

“I have still thought the subject worth bringing before the Society; first, because the *Greenwich Observations* are not read as carefully or as extensively as they ought to be (witness my own

* Hence at distance 1, Equatoreal Semidiameter = $83''.46$
Polar = $74''.34$

ignorance and that of Mr. Hartnup); and secondly, because the Astronomer Royal has only insisted upon that use of the principle which his own observations required. *Venus* may now be observed very easily; and if the following remarks are just, measures of *Venus* may be employed to give a careful observer much insight into the defects of his telescope, as well as into his own personal qualities and errors.

“It is well known that a bright object, viewed even by the best telescope, appears under an angle somewhat larger than it ought to do; which increase differs, probably, according to various circumstances. A bright image on the retina seems to extend its influence beyond its immediate locality. This is, if I mistake not, generally called irradiation. Again, from the principles of the undulatory theory, the image of a bright point is always of some extent, and is all the larger, the smaller the aperture of the object-glass or mirror in respect to its focal length. Lastly, any defect, such as spherical aberration (which is usually largest in large apertures and short foci), tends to increase the image. It is, therefore, somewhat puzzling to say what the *true* subtended angle in any case is, and difficult to reconcile the statements of different astronomers with different telescopes and under differing conditions. Passing by irradiation for the moment, let us first see how a spurious disc from the other causes mentioned may be reduced to the true disc by the method suggested by the Astronomer Royal.

“Make careful measures of the diameter of *Venus* (with a wire-micrometer or a double-image micrometer), when she is nearest the earth, and also when she is most distant. These measures are best made in daylight, as there is then little or no irradiation, and the limb is seen most steadily. It is easy to get two sets of observations in which the respective distances of *Venus* and the earth are as 1 : 4; and it is evident that the errors from the undulatory theory, a defective object-glass, &c., will alter the apparent disc of the planet by the *same* angular amount, whether the planet be seen under a large or a small angle. Let the true diameter of *Venus* at distance 1 = θ , and let the observed diameters at distances $d, d',$ &c. be $\phi, \phi',$ &c.; also let the spurious increase be e , either from the causes above mentioned, or an erroneous habit of making the measure.

Then

$$\frac{\theta}{d} + e = \phi, \quad \frac{\theta}{d'} + e = \phi'$$

in which θ and e are the only unknown quantities: these are found very accurately, when d and d' differ very much. (The effect of a bad habit of measuring with the wire-micrometer, or in forming the contacts with a divided eyepiece, is got rid of by the above process, that is to say, it is lumped with the spurious disc.)

“To ascertain the effect of irradiation, measure the planet in the daytime, and at night when brightest. The difference in these measures is due, probably, to irradiation. Measure again, throwing in all the light you can, and using as dark a glass as will allow

satisfactory vision. It will soon be seen to what extent irradiation increases the apparent diameter. What is left of irradiation in daylight, may be eliminated when the law is determined which connects the phenomenon of irradiation with intrinsic brightness and the effect of additional light on the retina.

"If measures of *Venus* point out any defect in a telescope and the law of that defect, the rule so obtained will apply to all other measures of the moon, planets, &c., by the same person with the same telescope. And if such an inquiry does not lead to consistent results, it would seem to follow that there are in telescopes errors other than we have been accustomed to suspect, and obeying different laws.

"The great intrinsic brightness of *Venus* and her manageable diameter make her far fitter for experiments on irradiation than the sun or moon, which can only be compassed by a heliometer."

Observations of Solar Spots at Mr. Lawson's Observatory, Bath.
By Mr. E. J. Lowe.*

"As the solar disc during the last few days has exhibited some remarkable phenomena, I send an abbreviated account made with the 11-foot refractor; several powers were used, but 55 was the usual one.

"The spots are distinguished as B, C, and A, and their relation to the centre of the sun is expressed by co-ordinates through his centre, *a* above, *b* below, *r* right, *l* left. When a spot is near the edge it is more convenient to refer it to the edge, and the word *edge* means that the spot is as far from the edge as the figures denote. The direction refers to the sun as seen in an inverting telescope. The figures and fractions are in digits and fractions of a digit.

* In reply to some inquiries, Mr. Lowe informed the Editor that observations of solar spots at the Bath Observatory are made thus:—A reticule of small squares is used as a micrometer, each interval being, very nearly, half a digit, or $\frac{1}{2}$ of the sun's diameter. These spaces, which are about 80", are, in the language of the Bath Observatory, each called 7°, *i. e.* supposing the sun's diameter about 180°. The mode of registering the observations is very simple and neat. For every observation there is an engraving, in which the reticule wires are represented and numbered, so that when the sun is brought into its proper place in the telescope, each spot is referred at once to its own square in the drawing. For details, a larger system of squares is engraved below the reticule; in these the remarkable spots are carefully drawn, and referred to their proper places by letters: Mr. Lawson's telescope has 7 inches aperture (a very fine glass by Dollond), and is equatorially mounted, with clock-work. The position of the spots is noted with a power of 55 applied to *Lawson's Solar Eyepiece*, which takes in the whole image of the sun; the details are completed with other powers. There is, besides, a 5-foot telescope on a stand, with a vertical and horizontal motion. Mr. Lawson has sent 10 drawings on days referred to in this paper.

	Bath M. T.		B.	C.	A.
	h	m			
Feb. 23	0	0	$1\frac{3}{4} a$	$2\frac{3}{4} b, \frac{3}{4} r$	
24	1	30	$2\frac{1}{2} a, \frac{1}{4} r$	$1\frac{3}{4} b, \frac{3}{4} l$	5 edge.
25	2	30	$3\frac{1}{4} a, \frac{1}{4} l$	$\frac{3}{4} b, 1\frac{3}{4} l$	$5\frac{1}{2} b, \frac{1}{4} edge.$
25	23	30	$3\frac{1}{2} a, 2 l$	1 b, 2 l	4 b, 1 edge.
27	0	0	4 a, $3\frac{1}{2} l$	$\frac{1}{2} b, 3\frac{1}{2} l$	3 b, $\frac{1}{4} l$
28	22	0	3 a, $\frac{1}{4} edge.$	$\frac{3}{4} b, 1 edge.$	
March 1	23	30	Disappeared.	$\frac{3}{4} a, \frac{1}{2} edge.$	$1\frac{3}{4} b, \frac{1}{4} r$

" 1849, February 23, 0^h. A very large spot, the *umbra* of which was $\frac{1}{2}$ digit in length and $\frac{1}{3}$ in breadth, surrounded with much *penumbra*, was situated with its lower edge $1\frac{3}{4}$ digits perpendicularly above the sun's centre (inverted eye-piece); this, for distinction's sake, we shall call B; also a mass of *penumbra* (C, with no large *umbra*) of $1\frac{1}{2}$ digits in length, and $\frac{3}{4}$ in breadth, about $2\frac{3}{4}$ digits perpendicularly below the sun's centre, and $\frac{3}{4}$ to the right. There were other smaller spots and clusters. The corrugations were very strong, and extended more or less all over the sun's disc, being most marked in the E. and W.

" Feb. 24, $1\frac{1}{2}^h$. The spot B had not moved with the rotation of the sun, but had retrograded $\frac{1}{4}$ digit, it is $2\frac{1}{2}$ digits above the sun's centre. The mass C had moved with the motion of the sun. At 5 digits below the centre of the sun, a notch of $\frac{1}{2}$ digit in length was cut out of the edge of the sun. In an hour's time the notch had sensibly increased. Clouds prevented further observation.

" Feb. 25, $2\frac{1}{2}^h$. The indentation in the edge of the sun has disappeared, but a spot A, of great dimensions, is situated $\frac{1}{4}$ digit from the sun's edge, which accounts for the notch seen yesterday.* The motion of the spot B is again direct. C is becoming less dense.

" Feb. 26, $1\frac{1}{2}^h$. A remarkable occurrence with respect to the spot B took place; it was first noticed by Lieut. Hardy, who called my attention to it. The *umbra*, which was of an elongated form, opened in the centre, and so divided it into two parts; it always opened from the lower edge, and was alternately open and closed at intervals of 15^s ; this was very sensible, and the experiment of marking the time which elapsed between the openings was repeated many times. The *penumbra* did not change its form. A is a fine single spot.

" Feb. 27, 0^h. Spot B had divided into two spots at that part where the partial openings were yesterday, and the lower spot of the two had become smaller. At 0^h 10^m it was noticed that this

* "I find the following entry in Mr. Lawson's observatory-book:—'Camberwell, 1846, June 30. Viewed the sun through the fine achromatic just completed by Mr. Dollond, of 12 inches clear aperture. (The whole aperture was used by means of 'Lawson's Solar Eye-piece.') Saw the limb of the sun notched. In about two hours the notch or indentation had disappeared, and a large spot was visible. All agree as to the appearance of the notch on the limb of the sun; powers used were 70 and 150. Signed, G. DOLLOND, G. HUGGINS, and H. LAWSON.'"

smaller spot also opened from beneath in the way that the whole spot had done yesterday, only those openings took place every minute, remaining open from 5^s to 8^s of time. These separations were observed ten times during as many minutes, when this phenomenon ceased at this part of the spot, but the division between the spots now alternately enlarged, and partially closed, at intervals of a minute, remaining widely open each time from 5^s to 8^s. At several periods the two spots appeared to overlap each other, for they joined, and the edge of the smaller spot was indented. At 0^h 30^m the oscillations were abating; clouds came over. The spot A had also become divided since yesterday, and shewed signs of a further division, for in the lower of the two spots were two indentations, the one above and the other beneath. 1^h 7^m. Again sunshine. The lower spot in A divides at intervals of 30^s, and closes again. There was also thought to be a light flowing from behind the *penumbra* at the upper edge.”*

Extract of a Letter from W. S. Jacob, Esq. inclosing two Sheets of Diagrams of Solar Spots observed at Poona, in December 1848, and January and February 1849.

“I beg to call your attention to a remarkable phenomenon that I do not remember to have seen or heard of before, viz. an *annular* spot, which was seen on the 1st of February: it is marked *a* in the diagram of that date, and I have also sketched it on the margin on an enlarged scale: the dark spot was of an irregular pentagonal shape, with a bright speck not quite in the centre. I had a suspicion of a filament uniting it to the side of the *penumbra*, but the power of my instrument (a 3½ feet) was insufficient to verify this. A similar phase has this day appeared in another spot, which will be shewn in the next sheet.”

Captain Shea exhibited a book, “containing daily observations of the spots which pass over the sun’s disc, taken with a three-foot telescope, by Carey.” There are four rows of circles in each page, and the book, if complete, would shew a picture of the disc on every day when the sun is visible. The corresponding days in each year are under each other. Captain Shea says his drawings prove “that spots which disappear on the thirteenth day do *not* reappear on the thirteenth day afterwards, and that they cannot be considered as fixtures.”

On the 9th and 10th of last November, Captain Shea “clearly

* The circumstance of streams of light crossing solar spots was seen by Mr. Lawson the day of the solar eclipse of May 15, 1836, in a spot whose *umbra* was of the shape of the ace of clubs, only the *penumbra* in this case was not of usual aspect, but resembled flocculent clouds. The streams of light closely resembled coruscations of *aurora borealis*. The *umbra* of this spot was 10080 miles in diameter, and the surrounding shade 32200 miles.

saw large streaks on the sun, having the appearance of water, extending from both eastern and western limbs about one-sixth of his diameter towards the centre, several small spots being distinctly visible on the streaks."

In some additional remarks upon the spots, Captain Shea says, "These spots take thirteen days to pass over the centre of the sun's disc, and although there is a constant succession of them, I have not been able to discover any day, for the last eighteen months, that the same number have appeared a second time as to size or relative position to each other."

A correspondent wishes to know where he can find the most complete account of the solar spots.*

Lunar Eclipse of March 8, 1849. By Professor Challis, *with the Five-foot Equatoreal, at the Cambridge Observatory.*

"The commencement of the eclipse was estimated to have taken place at $11^h 25^m 53^s$, Greenwich Mean Time, and the end at $14^h 25^m 43^s$, Greenwich Mean Time. The degree of obscuration of the limb at these two times was judged to be very nearly the same, but whether the shadow was in actual contact with the limb was quite uncertain. It is probable that the mean of the times, viz. $12^h 55^m 48^s$, Greenwich Mean Time, may be compared with considerable accuracy with observations made in a similar manner elsewhere.

"The disappearance of 82 *Leonis* was observed with great exactness to take place at $13^h 13^m 17^s.62$, Greenwich Mean Time. The occultation occurred at the part of the limb which was most obscured by the eclipse, and as the moon's periphery was still very visible, I took particular care to notice whether there was any projection of the star on the moon's disk. The star made a kind of indentation of the limb without apparent diminution of brightness, and disappeared instantaneously, as soon as the periphery passed through the centre of its brightness.

"I noticed a faint, ruddy light spread over the eclipsed portion of the moon's disk, most conspicuous at the parts most remote from the boundary of the shadow. By looking at the moon with a small telescope, magnifying fourteen times, this appearance was rendered very sensible. I have never observed anything similar when the illumined part of the moon's disk has been visible between new moon and the first quarter. It seems hardly possible to doubt that the origin of this light is the same as that of the redness of the sky at sunrise and sunset."

* Photographic pictures surely would be attainable with a telescope mounted equatorially, and carried by good clock-work. For researches into the *motion* of the spots, the positions should be determined micrometrically, or an image thrown on a screen might serve, with proper precautions. Reference should be made to the N and S, and to the preceding and following limbs.

By Mr. Hind, at South Villa Observatory.

“ Beginning of the eclipse at $11^h 25^m 18^s$ mean time. The end was not observed.

“ Nothing unusual was remarked. The shadow had a greenish tinge. About the time of greatest phase it was dark enough to render the eclipsed limb barely traceable with a power of 50 on the eleven-feet refractor.”

Mr. Chalmers, at Weston-super-Mare, observed as follows :—
“ I saw a star of the sixth magnitude approaching the moon. It travelled along the dark edge, impinging on it, for about 6^m or 7^m . At a quarter past one it was occulted, disappearing entirely. Within two minutes it reappeared, and again travelled along the edge of the moon for about 2^m or 3^m . It was then a second time occulted, and reappeared in about 10^m , when it finally quitted the moon.”

On the Longitude of Hobarton, Van Diemen's Land.

By Commander Shadwell, R.N.

This determination is deduced from meridian transits of the moon observed by Lieut. Kay, R.N., in the years 1843, 4, and 6, while in charge of the Magnetic Observatory there. The instrument employed is an excellent transit by Troughton and Simms, of 30 inches focal length, and $2\frac{3}{4}$ aperture, mounted on an iron stand. The position is stated to be “ in the garden of the Magnetic Observatory at Rossbank, about a mile outside the town of Hobarton.”* Commander Shadwell, after a careful examination of the observations, level readings, &c., speaks highly of the correct adjustment of the instrument and the skill of the observer.

There is a large gap in the series, caused by the breaking of the tube of the level, which was sent to England for reparation. One or two spare tubes should always accompany the transit on distant expeditions, and, in case of need, an observer should be ready to supply the place of the level by observations in a mercurial surface.†

In computing Lieut. Kay's observations, Commander Shadwell has used Mr. Riddle's formula, taken from the twelfth volume of the *Memoirs* of the Society, except that he has applied “ the sidereal time of the moon's semidiameter passing the meridian ” to

* This description is somewhat vague, the site of the transit has probably been connected with some fundamental point, to which the station of Hobarton is referred ; if not, no time should be lost in effecting the connexion.

† Either by an eyepiece, with which he can see the wires reflected, looking downwards, and so adjust ; or by noting the transits of two or three high known stars, as seen in the mercury, which, compared with transits of other known stars, seen *directly*, will give an excellent level error, and with very little trouble.

the time of transit of the bright limb, to get the right ascension of the moon's centre at the time of transit.

In taking the means of the various results, Commander Shadwell has followed Mr. Taylor (Vol. xvi. of the *Memoirs* of the Society), and "assigned to each night's observations a weight proportional to the square root of the number of stars compared with the moon, and multiplied by the motion of the moon in right ascension during one hour of longitude, using the mean of her true motion for the interval between the observations." *

Treating the observations in this manner, Commander Shadwell finds the following longitude of Lieut. Kay's station, Hobarton, by comparison with the English standard observatories :

	By 1 st Limb of Moon.			Obs.		By 2 ^d Limb of Moon.			Obs.
	9	49	26 ^s 03 E.			9	49	15 ^s 68 E.	
Greenwich				9					3
Edinburgh			24 ^s 12	14				21 ^s 72	4
Cambridge			31 ^s 94	4				20 ^s 24	9
Oxford ..			25 ^s 67	5					
Mean	9	49	26 ^s 06	32		Mean	9	49	19 ^s 38
									16

Mean of both limbs $9^h 49^m 22^s.72$ E $= 147^\circ 20' 40''$ E.

Lieut. Kay finds the latitude of his observatory, by 40 circum-meridian altitudes of the sun $= 42^\circ 52' 12''$ S.

Proposal of a Method for Eliminating the Effect of Personal Equation in Computing Longitudes from Transits of the Moon.
By Mr. Sheepshanks.

"Many years ago a practical observer threw out the idea of determining longitudes by transits of the sun. He had, as may be imagined, a very imperfect idea of the nature of the problem,† but his mistake suggested to me the following remarks, which may, perhaps, be of use, though in a very different way from that proposed.

"The effect of irradiation is, I think, to be most easily ascertained by observations on *Venus*, in the manner suggested by the Astronomer Royal, and more explicitly pointed out in a paper read at the last Meeting, but besides an error from this cause or from a variation in the apparent diameter due to the imperfection of the telescope, there is undoubtedly a personal equation in *observing a limb* as distinguished from a *star*, and most probably a *different*

* The proper mode of combining moon-culminating determinations requires considerable care ; there is not, so far as we know, any English solution which can be considered as a fair approximation to the most *probable* result.

† Even now it is not uncommon to hear of young astronomers observing lunar transits for determining *minute* differences of longitudes, and complaining of the discrepancies they find. Such observations are excellent practice, but not available to the object proposed.

personal equation, according as the first or second limb is the object observed. I will not stop to allege various instances where these anomalies seem to have occurred ; every transit observer will admit that the phenomena of observing a star, or a limb of the sun or moon, are very different, and most, I think, will acknowledge that they have no feeling of identity of observation between the first and second limb.

“ I assume that the observations of the corresponding limbs of the sun and moon are liable to the *same* errors in this respect, and, perhaps, by a little attention to dark glasses, illumination and the effects of irradiation, may be nearly equalised for both bodies ; the *aperture* of the object-glass must always be the same in both sets of observations.

“ Suppose a large mass of observations of the sun and moon to have been made at two observatories, between which the difference in longitude is required. The lunar transits of the first limb, for instance, give

$$L = \text{the true longitude} + \frac{a-b}{m}$$

where a and b are errors of observation at the two places, owing to the *limb* as distinguished from a *star*, and m is the mean of the moon's motion per second. In like manner the transits of the sun's first limb give

$$L' = \text{the true longitude} + \frac{a-b}{s},$$

where s is the sun's motion per second, and a and b are the same as before, whence

$$L' - L = \frac{a-b}{s} - \frac{a-b}{m},$$

or
$$a-b = m s \frac{L' - L}{m-s}.$$

“ The true longitude is

$$L + s \frac{L' - L}{m-s}, \text{ or } L' + m \frac{L' - L}{m-s}.$$

“ The second limbs must be treated in exactly the same way, and if the two results agree, there will be a strong probability of their truth.

“ It is here *supposed* that the observations of the sun are as accurate as those of the moon, which, in standard observatories, is not far from correct. A traveller should always get the comparative error of himself and of his instrument by previous observations of both limbs of the moon, under a known meridian. This precaution is, it is to be feared, very seldom taken.

“ The moon is so regularly observed at Greenwich since the erection of the Altitude and Azimuth instrument, that the best data for calculating the longitude from lunar transits will often be taken from it. It is necessary that the relation between the indications of the Altitude and Azimuth, and the Transit, should first be fully

investigated, so that the error determined by the former instrument may be translated into the error which would have been found by the latter, before the comparisons with the data of the two instruments can be combined ; but this may be safely left to the Astronomer Royal, who is already engaged in the subject."

Elements of several Binary Stars. By Mr. Hind.

ξ *Böotis*.

"In Vol. VI. of the *Memoirs* of the Royal Astronomical Society, an orbit of this revolving star is given by Sir John Herschel, who founded his elements on all the observations between 1782 and 1833. On comparing this orbit with the angle observed in 1842, I found the computed position less by 16° , and accordingly attempted a correction of the elements. Adopting Sir John Herschel's numbers in the formation of equations of condition, I finally arrived at the following values, which are the best of several sets :—

Perihelion Passage 1780.43.	
Angle of Position at Perihelion	$98^{\circ} 57'$
Node	$6^{\circ} 0'$
Inclination to Plane of Projection	$78^{\circ} 27'$
Excentricity.....	0.7508
Period of Revolution ...	114.8 years.

The differences between the observed and computed angles at certain selected epochs are as subjoined :—

1782.28	comp ^d —obs ^d	=	-4.5°
1803.25	"	=	-0.5°
1822.40	"	=	$+1.8^{\circ}$
1829.43	"	=	-2.9°
1838.55	"	=	-1.0°
1842.30	"	=	$+1.5^{\circ}$

"At the time of Sir W. Herschel's first observation the position would be changing rapidly, the star being near its perihelion passage. I think the excentricity is the most uncertain element.

Σ 1938 near μ *Böotis*.

"Two orbits previously calculated by me for this close binary star have already appeared in the *Monthly Notices* of the Society. The Rev. W. R. Dawes having favoured me with several sets of measures taken with his large equatoreal at Cranbrook in 1847 and 1848, I have recomputed the orbit, these later observations being of high importance in the investigation.

“ My third elements of Σ 1938 are :—

Perihelion Passage 1851.75		
Projected Perihelion	219	0
Node	104	50
Inclination.....	58	2
Angle between π and Ω on the orbit	103	22
Excentricity	0.8775	
Semi-major axis	3''	08
Period of Revolution.....	458.65	years.

The maximum distance in the apparent orbit is 3'' $\cdot$ 35 at an angle of about 50°, and the least distance 0'' $\cdot$ 19 in the direction of about 200°. It is probable that the star will become single with the best telescopes in the ensuing year; the present is, therefore, an epoch of much interest, and it is to be hoped observers will not forget this object during the spring and summer.

70 Ophiuchi.

“ I have paid close attention to the elements of this remarkable binary star, which has been signalised by Professor Mädler as exhibiting a deviation from the Newtonian law of gravitation. After repeated attempts, I arrived at the following orbit :—

Perihelion Passage 1807.48		
Node	122	14
Angle between π and Ω on the orbit	168	6
Inclination	47	20
Excentricity	0.4973	
Period	88.48	years.

These numbers represent the observations tolerably well throughout, but there is still a tendency to give the angle too small between 1840 and the present time, which appears peculiar to most orbits that have yet been published.

“ By Encke's method, explained in the *Berliner Jahrbuch* for 1832, I found the excentricity 0.505, and the period of revolution 86^{yrs.}77; the results, however, are not so satisfactory as those given above.

τ Ophiuchi.

“ I think the orbit of this interesting star will prove something like the following :—

Perihelion Passage 1824.8		
Projected Perihelion	106	0
Node	130	
Inclination	48	30
Excentricity.....	0.575	
Period	104	years.

These elements are altogether different from those published by Professor Mädler in his *Untersuchungen über die Fixtern-Systeme*, which assign an orbit deviating but slightly from a circle.

λ *Ophiuchi*.

"The elements subjoined are perfectly satisfactory. They were calculated from all the observations known to me at the close of the year 1848. The angle given by Sir W. Herschel in 1802 is altered 180°, as the only way of reconciling the whole series of positions with any supposable orbit.

Perihelion Passage 1791·214	
Position at Perihelion	177° 50'
Ascending Node	30° 23'
Inclination.....	49° 40'
Angle between π and $\varnothing$ on orbit ...	135° 24'
Excentricity	0·4772
Semi-axis major	0''·847
Period	95·88 years.

In this orbit the least apparent distance = 0''·31 at an angle of about 125° and the greatest apparent distance = 1''·11 at an angle of 10°. The comparison with observations shews that the errors are small considering the great difficulty attending measures of this star."

Remarks on Irradiation. By Capt. Shortrede.

With reference to the subject of irradiation brought before the Society at last meeting, Capt. Shortrede states the following facts which he observed in Western India :—

"The island of Karanja, in Bombay Harbour, was one of my stations, the summit being about 1000 feet above the sea. The top of the pillar under the dome of the Observatory at Bombay is about 70 feet above the sea, and distant from Karanja about eight miles. To observe the centre of the pillar, I had the slit of the dome turned towards Karanja, and a heliostat being outside, the sun's light was thrown upon a screen having a circular hole, five-eighths of an inch in diameter, carefully adjusted over the centre of the pillar. Viewed from Karanja, the appearance of this was a beautiful planetary disc, perfectly round, the edges being *nicely* in contact with the sides of the slit on the dome. This appearance continued unvaried for several days, and there was no sensible difference by varying the aperture of the telescope from two inches to half an inch. The slit in the dome is fifteen inches wide, and the sun's light passing through a hole of five-eighths of an inch, seemed of exactly the same size. The object *appeared* equally bright throughout, and the edges were sharp and well defined.

"The telescope was one of Dollond's master-pieces; it had a triple object-glass of two inches clear aperture, and bore well powers of 40 and upwards; but for terrestrial objects I preferred a power of 25.

"Another fact of the same kind, but not admitting of such definite measurement, was that at Mandwi station. I had a referring mark on Bhatras, distant about seven miles, both being peaks at a mean height of about 4000 feet above the sea, and about 2000 feet above the intervening ground. The sun's light was transmitted through a hole three-tenths of an inch in diameter, and in strong daylight (with the telescope as well as with the naked eye) it had much the same appearance as *Sirius* by night. It had not the round planetary disc observed in the other case. The wires in the focus of the telescope subtended rather more than 3", and at their intersection they subtended between 3".5 and 4"; but I found that I could not get them entirely to hide the referring mark.*

"In each of these cases the apparent enlargement of the object may possibly have been chiefly owing to the light reflected from the particles of air very near the path of the ray. They are quite distinct from the enormous enlargements to be seen when the rays pass near the surface of the earth through an atmosphere of varying density, for in such cases the objects are always unsteady and flaring.

"I may mention also in reference to the visibility of small opaque objects on a bright ground, that on one occasion, from a station twenty-five miles or more to the eastward, I observed the Pangaon station at sunset, when the station-pole, being *projected on the sun's disc*, was a remarkably good object. For several days I had found it invisible otherwise. The pole was about twenty inches thick and about fifteen feet high. It did not occur to me that the breadth was sensibly diminished."

On the Manufacture of Optical Glass in England.

By Mr. Simms.

"The difficulty that has hitherto attended the construction of achromatic telescopes of large apertures in this country has arisen, as is well known, from the faulty state of our flint-glass manufacture, and notwithstanding the efforts that have from time to time been made with the view to its improvement, it has till lately continued so defective in all the qualities requisite for forming a good telescope, that I recollect to have succeeded in only two instances in my attempts to make with it unexceptionable object-glasses of only three and a-half inches aperture.

"Our supplies of flint-glass have, therefore, been drawn from the Continent, and although discs of great purity have been obtained

* 0.3 inch subtends 1" at the distance of a mile, nearly.

of diameters varying from four to nine inches, yet the first cost of the disc from the foreign manufacturer, and the subsequent risk of its not turning out well after the expenditure of great labour upon it, required necessarily so great a price to be set upon the finished article (to make it at all remunerative), that opticians, on the one hand, have been deterred from engaging in such costly and hazardous undertakings (which generally ended in loss), and astronomers, on the other, however ardent admirers of the science, have been prevented from engaging successfully in the pursuit.

"It will be gratifying to the members of the Society, and to the lovers of astronomy generally in this country, to learn that such a state of things no longer continues. After much labour, and no doubt at considerable cost, the firm of Chance and Co. of Birmingham, with the assistance of a foreign artist, have succeeded in manufacturing flint-glass for optical purposes by no means inferior, so far as my trials enable me to judge, to the very best that was formerly prepared by the elder Guinand. Besides several of smaller dimensions, I have made of this material, together with the crown-glass of the same firm, which has long been of excellent quality, one object-glass of six inches diameter, with which perhaps I have had as little trouble as the nature of such a work will admit of. I am about to make trial of a glass of much larger aperture than the one above mentioned, and the result of this experiment, of the successful issue of which I have no doubt, shall in due time be communicated to the Society."

Professor Potter, of University College, London, wishes to call attention to a communication published by him in Brewster's Journal, New Series, vol. iv. p. 18, from which it appears that the Professor used the *chilling* process in casting specula on an old steel mirror, and with perfect success, so far back as 1831.

Captain Shortrede presented a "perpetual calendar, giving the days of the week for all time." This consists of three small concentric circles of card, from which, when set according to the instructions, the day of the week corresponding to any yearly and monthly date whatever may be taken by inspection.

Sir Andrew Lang, Governor of St. Croix, mentions the occurrence of an aurora borealis at St. Croix, $17^{\circ} 44' 32''$ north latitude, and $64^{\circ} 41'$ west longitude. "The red lurid glare ascended high above the hills" and led several persons to believe that a tremendous fire had occurred on the islands of St. Thomas and St. John's, which are forty miles distant. This aurora was seen on the 17th of November, 1848, and it appears that an aurora of extraordinary brilliancy was seen on the same night over the north of the British islands, and also at Montreal. Sir Andrew Lang has been a resident in the West Indies for fifty-four years, and paid attention to meteorology for more than thirty years, but this is the first aurora which he has witnessed.

Mr. Lowe remarks with respect to Dr. Forster's communication (see *Monthly Notice* for January last, p. 37), that "from the 1st January, 1817, to the 31st December, 1848, the new moon has fallen 55 times on a Saturday, and that, consequently, the number of rainy days which ensued should be, according to Dr. Forster, about 1100."* On consulting the register of his friend Mr. Tatem, of Reading, Mr. Lowe finds "that rain occurred on 605 days. The number of fair days exceeded the number of rainy days 36 times out of the 55, and once no rain fell for 20 days."

In 7 cases rain did not fall on more than 5 days

29	”	”	10	”
10	”	”	19	”

In 8 cases observed at Greenwich, Mr. Lowe finds that once there were 4 days of rain, once 5 days, thrice 9 days, once 11 days, once 12 days, and once 17 days of rain.*

M. Fasel sent an elaborate drawing of the parhelia observed at Stone, March 29, 1848, and a meteorological register for 1848.

Professor Schumacher has had the kindness to forward the following elements of Goujon's comet, calculated by Professor Argelander :—

Perihelion Passage, 1849, May 26.5572, Berlin Mean Time.

	0	1	2
π	235	45	20
Ω	202	33	15
i	67	9	34
Log q	0.06413		Motion direct.

* Mr. Lowe has said that the number of rainy days, according to Dr. Forster, should have been 1500, but Dr. Forster's statement relates to the next 20 days after the new moon; the number of rainy days is $20 \times 55 = 1100$. The only way in which this matter touches astronomy (and, therefore, concerns the Society), is, that if an empirical rule connecting the weather with the *phases* of the moon, and with *certain* days of the week, were *established*, it might be the business of astronomers to give an astronomical form to the cycle, which again might lead to a physical explanation. Until the *fact* is agreed upon, the question is purely *meteorological*, and, as such, does not belong to us.

ERRATA.

p. 95, *for Stowe, read Stone.*

97, March 1st, Comp^d—Obs^d R.A., *for* $-1^{\circ}45$, *read* $-1^{\circ}37$.

103, Emersion of Jupiter's 4th Satellite, *for 11^h, read 14^h.*

